ARRANGEMENT FOR THE SORTING PROCESS OF HOME LAUNDERING AS AFFECTED BY ECONOMY OF MOTION

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INTRODUCTION

According to authorities in the laundry field, there is need for much research in all phases of the laundry problem. Dr. Elaine Knowles Weaver, a recognized equipment specialist, stated that progress in the field of laundry is a century behind the field of nutrition. Thus, there is need for progress in research in all areas of the laundry field.

The manufacture of automatic washers, high quality wringer type washers, ironers, dryers, syndets and other laundry reagents has brought about radical changes in laundry practices. These new developments and educational programs have motivated active interest in setting aside a special laundry area or utility room in the home.

More and more people are planning laundry centers when they remodel or build new dwellings. During the years 1947 to 1952, specialists in housing and home management for Kansas Extension Service assisted in the establishment of a total of 4,952 new homes and 22,220 remodeled homes as housing demonstrations. When a utility room was planned, families asked for suggested ideas for a sorting center in the room. Members of the Extension staff have attempted to give assistance, but have been handicapped by lack of sufficient scientific data.

Few homemakers have conveniences for the sorting of the family laundry. Some use is made of bushel baskets, old tubs, newspapers and old rag rugs to keep clothing off the floor, but most sorting is done on the bare floor. Homemakers are not fully aware that inefficient organization in the sorting center may result in increased fatigue and permanently poor posture.

At present, a sorting surface is considered optimum in effectiveness for the sorting process. In new construction where funds are available to provide adequate space, it is possible to plan to incorporate optimum sorting centers designed to meet correct postural requirements of the homemakers. This is not always possible in new construction where funds restrict adequate space, nor in the remodeled plan. The sorting surface, although optimum as a time and energy saver, is often sacrificed where floor space is limited, or funds not available for this construction.

Waste of human effort is more easily overlooked in tasks of short duration than in those that consume considerable time. The laundry operation is of long duration, and some study of it has been made to reduce human effort. The sorting of the items included in the laundry is one process of the laundry operation. Although it is of short duration, it may be one of the intangible wastes of human effort that produce fatigue in the laundry operation. As an Extension worker dealing with the laundry problem, the writer would like to contribute to the solution of the problem of providing simple ways for easing the sorting process. For these reasons, the following objectives were set up for this study:

I. To determine the sorting practices for the laundry of selected farm families.

II. To develop motion and time saving sequences for improving the sorting process of the laundry.

III. To determine sorting space requirements.

IV. To design simple and inexpensive arrangements of space and

holding devices which save time and motion, and permit recommended postural practices.

REVIEW OF LITERATURE

The popularity of a utility room in modern house construction where the fatigue factor has been studied has resulted in work areas where women can work more comfortably, and do the family laundry with less effort. All this has taken time-consuming planning, but the time spent proved valuable in work saved. It is easier, however, to plan optimum work conditions in newly constructed houses than it is in the remodeled house. For any room where laundry is done, Wilson, et al. (20) set up minimum floor space requirements for the washing operation as a width of 84 inches and a depth of 72 inches. This space allowed for laundry trays with minimum space for laundry operation around the trays. McCullough (12) set up maximum and minimum floor space requirements for the sorting operation with a width of 60 inches, and a depth of 32 to 36 inches.

The process of sorting consists of dividing the articles to be washed into the washer load, placing together those articles of like fiber and degree of soil requiring similar washing time, temperature of water and type of cleansing agent.

Then the question is considered — what space is necessary at working table height to allow the homemaker to sort an average family wash? The importance of the sorting table is stressed by Agan (1) when she states that the equipment necessary for sorting is a work counter, tubs or laundry

trays. She also urges that the floor should not be used as a sorting area unless no other space is available. Grady (7) further amplifies the importance of a suitable height for any counter when she said it would reduce fatigue.

> Home economists and specialists in physical education have demonstrated that there is a relation between correct working arrangements and correct body mechanics, and that both are factors which contribute to the lessening of fatigue in homemaking tasks.

Knowles (9) personalized the idea of working heights by stating:

> Just how one goes about choosing a comfortable height is an individual problem. If women were all made by the same pattern we could find a formula, but so far, none of the rule-of-thumb methods suggested by various authors for the best height for a job holds 100 per cent true. Body height is the least reliable measure.... Near sightedness and bi-focal glasses add still another problem.

Pond (18) set specifications for a work cabinet on castors for a sorting center 3 feet wide and 6 feet long, to be used in the utility room. This area was planned for sorting clothes, sprinkling, cutting, wrapping packages arranging flowers or for games. The counter on castors was also built for storage of soiled clothing and laundry supplies. The height of the counter was 33 inches.

Beginning with the assumption that the average height of American housewives is about 5 feet 4 inches, Heiner and McCullough (8) determined the most efficient working "zones". Standing erect, the hands are about 28 inches from the floor, a height of 72 inches can be reached without difficulty; a span of 48 inches can be encompassed. In a slightly oval zone, 48 inches across and 44 inches up and down, the housewife can work without bending over, stooping, squatting, climbing or excessive reaching. Interest in the reduction of fatigue, leading to simpler work methods, has

led to studies of tasks or parts of a task for the factors causing it. The sorting of the wash is spoken of as being tiresome and fatiguing. Fatigue and a negative attitude toward any task may be brought on by poor posture as stated by Agan (1):

> One of the earliest symptoms resulting from poor posture is a sense of fatigue out of all proportion to the work done.
>
> Fatigue is an inevitable and normal result of mental and physical activity, hence a certain amount of fatigue after either work or recreational activities is healthful and desirable. But, if fatigue is excessive for an extended period, it accumulates and a pathological condition results.

The need for research in this area is indicated by Knowles (9):

> As simple as the process of sorting clothes may seem to be, it was a part of the task that many women thought was disagreeable. Forty-six women took part in this study. Of the 23 women who thought sorting was tiresome, all but one sorted to the floor and she used a table. Of the 23 women who didn't think of sorting as being tiresome, 17 sorted to the floor, 4 sorted to a table and 2 sorted to chairs.

The size of the wash varies with the season, with the occupation of the family, its health, its grooming habits and stage in the life cycle. Eyres and Wiley (6) making a time and motion study of washings found that 42 to 46 pounds of soiled clothes was considered typical for a family of three.

When the homemaker starts on washday to divide the one big pile of the wash into several smaller ones, she has her first chance to try to find ways to save energy. Practical tests and laboratory time-studies have proved that careful sorting gives the worker cleaner clothes with less effort. What should be placed in each pile or sort is a point for discussion. According to the American Washer and Ironer Manufacturers' Association (2):

> The articles should be separated according to their kind, their color, the nature of the fabric and the amount of soil. A typical good sorting of a family wash is about like this: In one pile, table linens and white shirts. In another, slightly soiled bed linens and bath linens. In a third, underwear, soiled bath and bed linens and the like. Put light colored clothes in another pile. You can include cottons and linen articles, but not articles that may fade and run. In still another pile, place silks, rayons, woolens, blouses and other garments of light weight fabrics.

The sorting process differs to some degree according to the type of the washing machine used, whether it be the conventional agitator with wringer or spindrier in which most of the clothes are washed in the same water, or the automatic machine in which each load of clothes is washed in fresh water. This study will be directed toward sorting problems confronting the homemaker using the conventional washer with wringer or spindrier type of machine.

Conventional washers are, and will probably continue to be used in a large percentage of homes for some time. For many homes, nothing but a conventional washer will be the practical solution to the washing problem in the home. As long as over half of the washers used are conventional washers, sorting problems will exist. That the conventional washer is a stand-by has been stated by McGrath (13):

> The conventional washer is the one washer which can be used in every kind of home. Despite a constantly diminishing sales effort, conventional washers have, nevertheless, accounted for better than 54 per cent of the total washer unit sales in 1951.

As the wash is sorted into loads, the problem of the size of the load is an important factor. Overloading, overwashing and overbleaching produce excessive wear on clothes. Here, the problem that causes concern is that of preventing overloading. How much weight, and what are the contents of the washer load?

With every model, conventional or automatic, from each washing machine company, there is an instruction book or instruction card. There the homemaker is instructed in how to use the machine, and what weight of dry wash the machine is built to carry. All too often, the instruction book gets lost or the homemaker never receives a demonstration on the correct way to use the machine. Or, she may not have followed the instructions she had tucked away in a drawer because she had washed clothes for years and thought she knew "the feel" for deciding the load.

In the remodeling problem, where a porch or perhaps a pantry is being converted into a laundry area, space is so limited that provisions for the sorting of clothes is often omitted. This lack of planning tempts the worker to use the only convenient work space left, namely, the floor. In regard to this situation, Perkins, et al. (17) made the following observations:

> Almost none of the 411 women in the observed group had any convenience for sorting the clothes. Most (65 per cent) sort in the room where they do the washing, piling the clothes on the floor whether it is wood, cement, or dirt, whether it is clean, dirty, smooth or rough.

Why no more women devise simplified sorting areas at heights for proper posture to save loss of energy and to eliminate lost motion is probably a result of habit. It is so easy to do as we have been taught to do. Daughter does as mother did. The habit is formed in childhood and becomes a mechanical process, the urge for change not coming until the worker, through disability or age, is forced to look for a less fatiguing method.

There is some justification for thinking that there might be other devices that could be used to aid the worker in sorting the wash where there

isn't room for a sorting table. In these cases, holding devices should be designed so as to take up minimum space at correct height. This idea was developed to some extent by Carse and Jeffryes (5) with a set of bins on castors, one for each load of clothes. Then Perkins, et al. (17) suggested a less costly method in which the clothes basket was placed on a backless chair on castors in connection with a counter at a height to eliminate unnecessary stooping. Although several authorities have mentioned the use of baskets or boxes to hold the sorted load, the size of the basket or box suitable for the weight of the load has not been satisfactorily determined.

At this point, one becomes interested in the body motions of the worker as she goes about picking up and placing each item from the one big pile of soiled wash to the breakdown of wash loads. How does the worker go about using her body? Of what importance are the reaching, bending, stooping and twisting motions used in the sorting process?

The Gilbreths originated the method of micromotion study, and the technique was first made public in 1912. Micromotion made it possible to study the fundamental elements or subdivisions of an operation by means of a motion picture camera and a timing device which accurately indicated the time intervals on the motion picture film. This, in turn, made it possible to analyze the elementary motions recorded on the film and the assignment of time values to each motion. To study body motions, the Gilbreths listed certain "rules for motion economy and efficiency", and other investigators including Barnes (3) and Mundell (14) have verified them.

Those principles applying to the sorting process, are classified under the following three subdivisions:

I. Principles of motion economy as related to arrangement of the work place.

1. There should be a definite and fixed place for all tools and materials.

2. Tools, materials and controls should be located close to and directly in front of the operator.

3. Gravity feed bins and container should be used to deliver material close to the point of use.

4. Materials and tools should be located to permit the best sequence of motions.

5. Provisions should be made for adequate conditions for seeing. Good illumination is the first requirement for satisfactory visual perception.

II. Principles of motion economy as related to design of tools and equipment.

1. The height of the work place and the chair should preferably be arranged so that alternate sitting and standing at work are easily possible.

2. A chair of the type and height to permit good posture should be provided for every worker.

3. Tools and materials should be pre-positioned whenever possible.

III. Principles of motion economy as related to the use of the human body.

1. The two hands should begin as well as complete their motions at the same time.

2. Motions of the arms should be made in opposite and symmetrical directions, and should be made simultaneously.

3. Hand motions should be confined to the simplest and most appropriate with which it is possible to perform the work satisfactorily.

a. Finger motions.

b. Motions involving fingers and wrist.

c. Motions involving fingers, wrist and forearm.

d. Motions involving finger, wrist, forearm and upper arm.

e. Motions involving fingers, wrist, forearm, upper arm and shoulder. This class necessitates disturbance of the posture.

f. Smooth continuous motions are preferable to zig-zag motions or straight-line motions involving sudden and sharp changes in directions.

g. Rhythm is essential to the smooth and automatic performance of an operation, and the work should be arranged to permit an easy and natural rhythm whenever possible.

Eyres and Wiley (6) studied the sorting of the wash problems. Their attention was directed toward motions within the sorting process such as pulling the drawer out of the sorting table, removing shoulder pads, inspecting

for stains, pulling clothes out of the chute or bin, and inspecting pockets. Their study failed to consider the motions connected with laying articles in certain piles, shaking out unfolded garments and similar motions.

Lee and Wagner (10) said that there are probably no body movements which, if performed continuously and incorrectly, will do so much damage to the body as do the associated activities of stooping, lifting and carrying. They told of the Bethlehem steel safety engineers who developed a mechanical man which stooped and lifted. It was to demonstrate to their workers the difference in strain between the right and wrong way of lifting 15 pounds. When stooping is done from the squat position, the strain of the legs is 40 plus pounds, and on the back is 20 plus pounds, but when it is done from the bending forward position, the strain on the legs is only 15 plus pounds and on the back 60 plus pounds. Lee and Wagner thought: (p. 207)

> Those who habitually stoop to their work by keeping the legs straight and bending over from the waist and the back, tend to have poor posture, broad hips, strained backs and sagging abdomens.

Bratton (4) stated that women generally do not realize how much they are lifting when they pick up a small object from the floor. The energy cost of lifting the small object is not appreciable, but that of lifting a larger proportion of the body is considerable. She goes on to say: (p. 13)

> The average amount of oxygen used in reaching down to a height of 3 inches above the floor, with almost complete flection of the trunk, was 132 cubic centimeters per minute. To complete this movement it was necessary to lift the trunk against gravity and use muscles in the entire body, with the leg muscles only slightly involved. Reaching down to the same distance above the floor by means of a deep knee bend involved the greater use of the large muscles of the entire body.

She comments further that the greater consumption of oxygen for reaching to the floor by a knee bend as compared with a trunk bend raises a question. The knee bend is recommended by specialists concerned with body mechanics because it involves the large strong muscles of the legs and thigh while the trunk bend uses the smaller muscles of the back. The knee bend permits the trunk to be held comparatively straight while the trunk bend distorts body alignment.

METHOD OF PROCEDURE

The data used in this study consist of information obtained by interviewing 50 families. These families constituted a complete census of a designated area of open country within driving distance of Manhattan, Kansas. The complete census method was suggested by a statistician in the Kansas Experiment Station as a suitable substitute for the more costly random sample taken from a larger area.

The area designated comprised a block of sections in the northwest part of Pottawatomie County bordering the Blue River, and was believed to contain 50 families. An adjacent, predetermined area provided the remaining families when the test area failed to provide the expected number. Personal interviews with the homemakers in all of the 50 homes were made in January and February, 1952. Each interview required, on the average, about 30 minutes to complete.

The interview schedule, a copy of which may be found in the Appendix, was developed. The objectives were to determine the prevailing size and

content of the family laundry, the sorting practices for the laundry of the selected farm families, sorting and washing areas, and equipment used to do the task.

Data obtained from the interview schedule were tabulated and cross-tabulated, partly by International Business Machines and partly by hand. Cross tabulations were made on the basis of young, expanding or growing, mature, broken and old families. Findings from the tabulations are bases of all tables and charts, and of the experimental work in this study. Two experimental studies based on the contents and weight of the average washing were made: (1) the space required for each sort load in the preparation of the wash for the conventional type of washer; and (2) the posture of the homemaker during the process of sorting.

For the space requirement study, 8 and 10 pound loads making up a typical washing of clothes, were sorted to a graphed open surface to determine unconfined space requirements, such as is found when sorting on the floor, and to verify slightly more confined space on a table as established by earlier workers. The same weight of clothes were sorted to graphed boxes to determine confined space requirements, such as might be suggested for an improved method where the worker could use approved postural practices.

For the posture study, a micromotion movie using an 8 millimeter camera run at a speed of 1,000 frames per minute, provided an accurate and detailed record of posture changes during the sorting process. In particular, the degree of bend of the worker's back, determined by the use of a protractor was observed during the sorting process. Other time and

motion principles were illustrated in the film, and could have been investigated had time permitted.

For estimating the average foot-candle level in the rooms used for washing and sorting, tables developed by Westinghouse (11) were followed. Their equation was used:

$$\frac{A \times B \times C}{D} = \text{Average foot-candles (on horizontal plane, 30 to 36 inches from the floor),}$$

where A is the coefficient of utilization as indicated by the type of lighting fixture; B is the lumens as indicated by the size of bulb; C is the maintenance factor, including blackened and dirty bulbs, and D is a factor derived from the room area in square feet.

Photographs record space requirements for 8 and 10 pound washer loads, the angles of bend used during the sorting process when sorting to unconfined loads of clothes on the floor surface, angles of bend where holding devices were placed at a level to meet postural requirements of the worker, and examples of exercises for developing good posture.

This being a sample of 50, confidence intervals have a range of 14 per cent above or below that found in the study. Thus, if 72 per cent of the women in this study sorted soiled clothes to sort piles or containers on the floor, one infers that from 58 to 86 per cent of women in general do it the same way.

FINDINGS AND DISCUSSION

Data are presented describing storage areas of soiled clothing and linens, sorting areas, washing areas, sorting methods, equipment used, make-up of the wash, body motions involved in the sorting process task, lighting, and age groups and their attitudes toward the task. These all affect the ease with which the sorting task may be done.

Storage of the Soiled Clothing

Storage areas for soiled linens, household and personal, were in a great variety of locations throughout the house. The location seemed to depend upon the arrangement of the rooms of the house and the availability of the storage space near bedrooms or bathrooms, where soiled clothing usually collected. In several cases, space in more than one room was used to store soiled clothing.

Closets were used most frequently of all storage areas, as 34 per cent of the cooperators stored soiled clothing there. The porch, used by 30 per cent was the second most used area for such storage. Other rooms, in order of use, were: Bedrooms, by 22 per cent; bathrooms, by 18 per cent; unused rooms, by 12 per cent; halls, by 10 per cent, and utility rooms by 8 per cent of the group. Basements, washhouses, kitchens and pantries were listed by others, and totaled 20 per cent of the total group.

Although 56 per cent of the women said they did not have any temporary place for putting soiled things, the interviewer noticed soiled

Table 1. Location of permanent and temporary storage of soiled clothes and holding devices used.

Permanent Storage			Temporary Storage			Holding Devices		
Room	Times used	Per cent	Location	Number families	Per cent	Type	Number	Per cent
Closet	17	34	Hung to dry	18	36	Baskets	21	42
Porch	15	30	On hall floor	2	4	Baskets & hampers	8	16
Bedrooms	11	22	In stairway	1	2	Hampers	6	12
Bathrooms	9	18	Porch	1	2	Boxes	6	12
Unused room	6	12	No temporary storage.	28	56	Baskets & bags	3	6
Hall	5	10				Washer	2	4
Utility room	4	8				Others	4	8
Others	10	20						
Total	73	154		50	100		50	100

items in places that she considered temporary storage. She decided the women did not want to admit temporary storage, which they probably considered poor management.

The bushel basket was used by 42 per cent of the group as a favorite holding device for soiled clothing and household linens. Hampers or basket-hamper combinations were used by 28 per cent of the group. Other combinations of holding devices, including boxes, bags, the washer and special containers, were used by 30 per cent of the cooperators.

Temporary storage on clothes lines was used by 56 per cent of the group, with only 4 per cent using hall or porch floors. In the homes where there were babies or small children, clothes were temporarily stored on lines on the porch, near the stove and other areas for drying purposes. Dish towels were also hung on clothes lines outside or near stoves for thorough drying to prevent mildewing. Twenty-eight per cent did not use any temporary means of storage.

Soiled household and personal linens were stored together by 86 per cent of the cooperators, and kept separate by only 10 per cent of the group. The most heavily soiled work clothes, like overalls, were kept separately on the porch, Table 1.

Sorting Centers

The process of sorting was made more difficult for these homemakers because of the arrangement and size of the rooms of their houses. For this reason, it was necessary for 24 per cent of the women to do the

sorting process in a room other than the one where the washing was done. Eight different combinations of rooms were used, 5 of which included the kitchen for sorting or for washing. The combinations of rooms used by this group was a definite cause of waste motion in doing an efficient job of laundering.

The kitchen was used for both sorting and washing by 26 per cent of the women during the winter months. Over half of this group said they would move the washer to the porch as soon as it was warm enough for them to work on the open or unheated porch. Porch area was used by 20 per cent of the group for both sorting and washing, but in this case, the porch was either partly or completely enclosed so that they could work there, even in winter months. Another 12 per cent sorted and washed in the basement. Half of the latter group had laundry chutes; the rest carried the soiled clothing to the basement for sorting and washing. Only 10 per cent of the cooperators had utility rooms. The other 8 per cent were either sorting and washing in a wash house, or were using an unused room for sorting and washing area, Table 2.

The Wash Area

Cooperators in this study were washing in the most logical location according to their house plan. Most women indicated a desire for better laundry conditions. Several wanted suggestions for a plan for a utility room, using an existing porch location.

Table 2. Location of sorting center and washing center.

Sorting and washing together			Combination of separate locations			
Room	Number	Per cent	Sort	Wash	Number	Per cent
Kitchen	13	26	Kitchen	- Porch	2	4
Porch	10	20	Kitchen	- Unused room	1	2
Basement	6	12	Unused room	- Kitchen	1	2
Utility room	5	10	Dining room	- Kitchen	3	6
Wash house	3	6	Living room	- Kitchen	2	4
Unused room	1	2	Dining room	- Wash house	1	2
			Bathroom	- Porch	1	2
			Hall	- Porch	1	2
Total	38	76.0			12	24.0

Kitchens, basements or utility rooms were used by 60 per cent of all cooperators to do their washing. Porches were used by another 28 per cent. These porches were completely enclosed, partly enclosed and screened or open. Wash houses and unused rooms were used by the other 12 per cent of the group. These locations might be compared to the North Central Regional study (16) and the Illinois study (17). The choices of locations for doing the washing in this Kansas study are more like the choices in the North Central Region, than they are like the choices in the Illinois study. However, the porch is used more and the basement less in the Kansas study, than in the North Central study, Table 3.

Table 3. Comparison of location of washing areas in certain states.

Location of wash area	North Central per cent	Illinois per cent	Kansas per cent
Kitchen	38	25	38
Basement	19	27	12
Porch	15	28	28
Washroom	10	12	10
Wash house	9	24	8
Other	2	1	4
No washing	7		

Method or Sequences of Sorting

Locations of storage areas of soiled clothes having been studied in comparison to sorting centers and washing centers, the next step is the study of how the worker goes about getting the soiled clothes from the storage area to the washer.

On wash day or the evening before, 72 per cent of the cooperators carried the baskets, hampers or other containers of soiled clothing to the sorting center. Soiled clothes were carried by armloads from storage areas in the house to the sorting center by 18 per cent of the group. Sheets were the items often carried separately, by armloads, if the container was heavy to carry. Sheet blankets or double blankets were used in several homes where heating the house was a problem, or where older folks lived. These were not washed as often as were the sheets. Push containers were used by 4 per cent, while only 2 per cent used gravity by means of a chute as a method of transporting the soiled clothes.

When all clothing and linens were collected to the sorting center, 68 per cent of the women placed their wash on the floor, and another 28 per cent placed their load at chair or table level for sorting. Permanent sort boxes were used by one family and family members sorted the soiled clothing to the boxes, so they were able to by-pass the sorting step. The rest of them used other combinations. The practice of sorting the soiled clothing from the basket or hamper was used by 80 per cent of the cooperators. The group which carried the soiled clothing by armloads from storage areas, piled the items loosely on some surface for sorting, Table 4.

The system of sorting from the container or pile of unsorted clothing to the container or pile of sorted clothing did not follow any regular pattern with these cooperators. The majority, or at least one half of the group, sorted directly from the floor to the floor.

Table 4. Method of transporting soiled clothes to sorting center, and location of soiled clothes before and after sorting.

From permanent storage			Location before sorting			Location after sorting	
Transportation	Number	Per cent	Location	Number	Per cent	Number	Per cent
Carry container	36	72	Floor			24	48
			in piles	29	58		
			in a container	5	10		
By armloads	9	18	Chair			3	6
			in a pile	8	16		
			in a container	2	4		
Push container	2	4	Table			6	12
			in a pile	3	6		
			in a container	1	2		
Use gravity	1	2	Located containers	1	2		
Combinations	2	4	Combinations	1	2		
			Floor & baskets			4	8
			Floor & table			5	10
			Floor & washer			4	8
			Baskets			2	4
			Other combinations			2	4
Total	50	100		50	100	50	100

With the loads sorted to the floor, table or other surface, the next step in handling the soiled items was to gather them up and transport them to the washer. Those cooperators washing in the same room as the sorting center (76 per cent) saved time and energy by having the two areas together; but, as stated, there were 24 per cent who found it necessary to walk to an adjacent room to get the sorted loads. Under either condition, one trip was made for each washer load by 94 per cent of the group. The others had to make two trips to the sort center for one washer load. The loads were transported to the washer by armloads by 92 per cent of the homemakers, and in sort containers by 4 per cent. A combination of both methods was used by 2 per cent of the group.

Sorting consists of checking over each item, and placing together those things of like properties. Likeness in degree of soil, in fiber, color and color fastness must be considered as the worker places items into groups. Sorting also includes inspection for stain, emptying and brushing insides of pockets, closing zippers, removing ornaments and shoulder pads, and watching for small fabric breaks that would be increased by the washer action.

Since all of this checking process could be time consuming, it would be to the worker's advantage to sit down for the sorting process. In this study, however, only 4 per cent sat down to sort, and another 2 per cent sat down part of the time. Sitting to sort clothes seemed to be difficult under prevailing conditions in the majority of these sorting centers. Doubtless, a way could be found if the homemakers would only take a more positive attitude toward the idea.

Table 5. Stain removal practices and availability of supplies.

Method used	Number	Per cent	: Availability of supplies	Number	Per cent
Stains removed during sorting process	24	48	: Accessible	20	40
Stains removed previous to wash day	8	16	: Scattered	20	40
Both of above methods used	7	14	: Special kit	1	2
Total removing stains before laundry	39	78	: No supplies	7	14
No special problem of stain removal	11	22	: Other	2	4
Total	50	100	:	50	100

The practice of removing stains was followed by 78 per cent of the homemakers, while 22 per cent said they had no special problem of stain removal. It seemed that where stain removal supplies were kept on hand and within easy reach, more attention was given to stain removal, Table 5.

It appears that even when women know that mending of major damage should be done before the washing operation, it is not being done. The common reason for not mending beforehand was that they did not like to handle soiled clothing, they did not have time, or they just did not think it was that important. The general mending was done after wash day by 84 per cent of the homemakers, Table 6.

Table 6. Mending practices and availability of supplies.

Method used	Number	Per cent	Availability of supplies.	Number	Per cent
Mend before washday	5	10	Accessible	29	58
Mend after washday	42	84	Scattered	2	4
Both methods	3	6	Mending kit	19	38
Total	50	100		50	100

The conclusion based on this study of stain removal and mending practices is that educational programs should place more emphasis on the preparation of soiled items before they are placed in the washer.

Equipment Used

From a study made of conventional and automatic washers on the market, about 50 companies were found to be manufacturing 175 washer models. This gives the homemaker a wide choice in her selection of the washer right for her washing needs. Each model is designed for loads of specific weights of clothes. The most common models of conventional washers on the market carry 8, 9 or 10 pound loads. All models of automatic washers were also built to take either 8, 9 or 10 pounds with the exception of one which takes 18½ pounds of dry clothes, Table 7.

Table 7. Load weight of washers on the market and of those owned by the cooperators.

On market (Conventional)			Owned by cooperators		
	Number	Per cent		Number	Per cent
7 pounds	4	4.7	8 or less pounds	1	2.0
8 pounds	33	38.9	9-10 pounds	5	10.0
9 pounds	26	30.6			
10 pounds	18	21.1	Didn't know	43	86.0
5-6 sheets	1	1.2	No washer	1	2.0
6-7 sheets	3	3.5			
Total	85	100.0		50	100.0

Of the 50 homemakers interviewed, all but one cooperator owned a power washer; she used a wash board. The conventional type washer, with wringer, was owned by 88 per cent of the group, and with spin dryer, by 6 per cent of the group. Only 4 per cent owned automatic type washers.

Most of the cooperators did not seem to follow the washer instruction book for deciding the size of the load for their washer. Only 12 per cent knew what weight of soiled dry clothes their washer was built to handle while 86 per cent did not know how to load their washer in terms of weight. Several offered to go look for their instruction book for this information.

The size of the articles to be washed was the most common method used for deciding the wash load, — this method being used by 42 per cent of the cooperators. The feel of the articles in the water was also a popular method, with 32 per cent using this method. Another 12 per cent counted articles, using this as a basis for deciding the load. Other methods used were: by the swish of the water; a "clothes line" in the washer; water over the top of the clothes; fill the washer full and leave 3 inches at the top of the washer, Table 8.

Authorities in the laundry field attribute the failure to get a clean wash to overloading, overwashing and overbleaching. Perhaps, if homemakers used weight for the basis of the washer load, they might add to the life of the family clothing.

Make-up of the Wash

Since the interviews were made to the 50 homes during January and February, the washings were lighter than might be found during summer months. Some families were forced to use blankets instead of sheets where houses were not well constructed, where there was no central heat, or where old age was a factor. Clothing was not changed as frequently

Table 8. Methods used by cooperators as a basis for the washer load.

Basis of washer load	Types of washers					
	Wringer		Spin			
	Conventional		Conventional		Automatic	
	Number	Per cent	Number	Per cent	Number	Per cent
Size of article	18	40.9	2	66.7	1	50.0
Feel of articles in water	15	34.1				
Number of articles	5	11.3	1	33.3		
Others	6	13.7			1	50.0
Total	34	100.0	3	100.0	2	100.0

as in the warmer months, and a different type of clothing was worn. The average size family was 3.4 persons.

The content of the average load for the group was as follows:

Load I
White: Light soil
- 3 sheets
- 4 pillow cases
- 1 tablecloth
- 1 man's white dress shirt
- 2 men's handkerchiefs

Load II
White: Heavier soil
- 1 sheet
- 9 dishtowels
- 1 white cotton slip
- 1 brassiere
- 2 pair, white socks
- 2 light blouses
- 1 man's light colored shirt
- 1 light colored print dress

Load III
Light color: Light soil
- 6 bath towels
- 4 hand towels
- 6 wash cloths
- 2 pair, pajamas
- 4 pair, cotton panties
- 2 pair, men's underwear

Load IV
Darker colors: Light soil
- 4 pair, light colored socks
- 2 colored cotton dresses
- 2 aprons
- 1 man's dark colored shirt

Load V.
Dark colors: Heavy soil
- 2 pair, jeans
- 1 pair, bib overalls
- 3 pair, dark socks
- 1 bandana handkerchief

Load VI
Rugs

The average for the 50 cooperators was 6.5 loads. The broken families seemed to have the smallest washing or a total of 5.1 washer loads per family, and the expanding and mature families had the largest or 7 loads. Either on washday or at another time, 70 per cent of the group did a special washing once a week of rayons and other things they did not want to include in the family washing.

The weight of the average washing was 40 pounds. From the study of conventional washers and the large proportion of models on the market built to carry 8 pounds of dry soiled clothing, we would come to the conclusion that this group of cooperators, on the average, was not overloading their washers.

Space Requirements for Loads

A study of space requirements of an average 8 pound load was made. For this, the reverse side of a piece of oilcloth, 4 x 7, marked into foot square bars was used on the floor to receive the sorted loads. It was found that an 8 pound load would pile nicely in an unconfined 4 square feet of space, so 6 piles of sorted clothing would spread over a space 4' x 6' if neatly placed; larger, if each item was thrown to the floor carelessly, Plate I. Using the squared material on a table surface and slightly confining each pile, the 6 loads could be piled on a surface 3' x 6'. This was the same amount of space found by Wilson and Pond working separately, Plate II.

Different sized cardboard boxes marked off in inch squares were next used to find a good confined area for a sort box. Again, the 8 pound load was used as the unit, and several loads of different contents were tried. It was found that a cardboard box, 16" x 16" x 12", would suffice. The conclusion was that too large a box might invite the worker to add too large a weight, and encourage overloading of the washer, Plate III.

EXPLANATION OF PLATE I

Space requirements of 4' x 6' for 6 unconfined piles of sorted clothing placed at floor level.

PLATE I

EXPLANATION OF PLATE II

Space requirements of 3' x 6' for 6 slightly confined piles of sorted clothing placed on a sorting table.

PLATE II

EXPLANATION OF PLATE III

Space requirements of 16" x 16" x 12" box, bin or drawer area for one confined 8 pound load of soiled clothing.

PLATE III

Body Motions Involved in the Sorting Process

We are living in an age of rapid change. Great effort is being made to conserve human energy for more useful living for all ages. All homemakers should be alert to find ways to take the drudgery or waste motion out of the routine tasks of housework. Moreover, we have an aging population wherein homemakers need added consideration if they are to stay useful and healthy.

Physical fitness increases materially the opportunities for living an active, useful life. Many people live at a level of fitness far below their capacities, making drudgery both of work and play. Good posture is basic to physical fitness, and is essential for any homemaker if she is to be able to do her housework easily and without undue effort.

Good posture is that ability to maintain body segments in correct alignment. This depends primarily upon the art of keeping the body segments balanced, one above the other, centered over the base of support and in line with the pull of gravity; beyond this, it also depends upon the strength and endurance of the skeletal muscles and the skill and will to use these muscles efficiently, Plate IV.

All movements of the body are brought about through the action of muscles. The more a muscle is worked, the more oxygen it must have, therefore, the heart and lungs must work more to supply the necessary oxygen.

In this study, 94 per cent of the 50 homemakers lifted and carried filled baskets, hampers or armloads of soiled clothing from storage areas

EXPLANATION OF PLATE IV

Cooperator standing with body segments
in correct alignment of good posture.

PLATE IV

to a sorting center. They were also washing from 35 to 45 pounds of clothes and linens each wash day. Lifting and carrying heavy loads puts great strain on trunk muscles. Back strain is minimized when legs can carry the weight of the load. Those people who habitually work by keeping their legs straight and bending from the waist and back, tend to have poor posture, broad hips, strained backs and sagging abdomens.

An analogy between the motions used in this study and those illustrated by Bethleham Steel was made. If the operator were to life a 15 pound load, including basket and clothing, and to bend from the waist, the strain on the legs was only a little over 15 pounds, but the strain on the back was over 60 pounds. If the operator were to stoop in a squat position to pick up the load, the leg muscles would carry the heavy load or a little over 40 pounds, while the back muscles would be relieved of much strain, and would carry a load of only 20 pounds, Plates V and VI.

The cooperators contended that they needed exercise in jobs like sorting clothes to keep in good muscle tone. Because of lack of information on body mechanics, these women were using trunk muscles incorrectly. This would add to muscle soreness and a feeling of fatigue by the end of the work day. They would be far better off if they would find easier methods to do these tasks, and obtain muscle tone from recommended exercises. The mechanics for stooping are as follows:

1. Keep the body erect.
2. Stand close to the object to be lifted.
3. Have one foot in advance of the other with the weight between the feet.

EXPLANATION OF PLATE V

Lifting 15 pound load of soiled clothes the wrong way, by placing a light load of 15# pounds on strong leg muscles and a heavy load of 60# pounds on weaker trunk muscles.

PLATE V


0
10
20
30
40
50
STRAIN ON LEGS
0
15
30
45
60
75
STRAIN ON BACK
15 LBS.

EXPLANATION OF PLATE VI

Lifting 15 pound load of soiled clothes a better way, by placing the heavy load of 40 pounds on the stronger leg muscles and a light load of approximately 20 pounds on trunk muscles.

PLATE VI


0
10
20
30
40
50
STRAIN ON LEGS
0
15
30
45
60
75
STRAIN ON BACK
15 LBS.

4. Keep the trunk erect; bend at hips, knees and ankles.

Plates VII, VIII and IX illustrate one of the exercises designed to increase the flexibility of the spine and legs. When this exercise is properly executed without knee bend, the mobility of the spine is increased as would be observed by the increased range of movement in each of the illustrated three directions.

Carrying heavy loads of soiled dry clothes incorrectly, produces fatigue. Carrying heavy loads of wet clothes outdoors to the clothes-line is even more fatiguing because wet clothes are twice as heavy as dry clothes, Plates X, XI and XII. The mechanics for carrying are as follows:

1. Keep erect and tall.
2. Keep the load close to the body.
3. Don't carry the load directly in front of the body.
4. Use holding devices on wheels to take the direct load away from the worker; push or pull the load.

Although 76 per cent of the 50 homemakers interviewed did not think of the sorting process as being tiresome, it was amazing to learn that there were 74 per cent who sorted some or all loads to the floor. A micromotion study was made of an operator sorting an average farm family washing from a basket on the floor to 6 average sort loads on the floor, and then lifting those sorted loads to a conventional washer in the manner practiced by these homemakers. By use of a protractor, the angle of bend of the operator's back in each frame of the film was read. The fulcrum of the protractor was placed at the thigh bone, and a line

EXPLANATION OF PLATE VII

First position in good exercise to strengthen trunk muscles.

PLATE VII

EXPLANATION OF PLATE VIII

Second position in good exercise to strengthen trunk muscles.

PLATE VIII

EXPLANATION OF PLATE IX

Third position in good exercise to strengthen trunk muscles.

PLATE IX

EXPLANATION OF PLATE X

Carrying heavy load of soiled clothing in front of body places heavy strain on trunk muscles.

PLATE X

EXPLANATION OF PLATE XI

Placing heavy load of soiled clothing
to one side of body and balancing
load protects trunk muscles.

PLATE XI

EXPLANATION OF PLATE XII

Placing the heavy load of soiled clothing on wheels and pulling the load saves trunk muscles.

PLATE XII

extended to the tip of the ear. A wooden gadget was constructed to record the following angles of bend of the cooperator in photography. The readings were grouped to indicate her postural positions:

90° to 75° regarded as standing nearly erect,
75° to 45° slightly bent,
45° to 15° greater flexion of back,
15° to 0° nearly to right angles,
0° to -15° reaching to within 3 inches of floor,
-15° to -45° bending and squatting to pick up loads from floor.

These are illustrated in Plate XIII.

The operator spent 1 per cent of the total time within a 75° to 90° angle during the period of sorting the soiled items to the sort piles on the floor, and of lifting the sorted piles each in its turn into the washer. Then the operator started a fast downward bend and never returned to that position until the task was completely finished. This is illustrated in Plate XIV.

The operator worked for 11 per cent of the total time within a 45° and 75° angle. More of the time, while in this angle of bend, was spent in arranging the sorted load in the washer than in placing items into the piles of sort. This is illustrated in Plates XV and XVI.

The operator worked in a 15° to 45° angle of greater flexion of the back for 25 per cent of the total time. In this angle she seemed to spend time in making decisions on which sort pile to place soiled items. This is illustrated in Plate XVII. There was also twisting motion in her trunk muscles as she turned from right to left. In the 0° to 15°

EXPLANATION OF PLATE XIII

Per cent of time spent by the operator in different degrees of bend.

Fig. A. Sorting from container on floor to 6 sort loads on floor, and lifting the 6 loads to the washer.

Fig. B. Sorting from sort container to 6 load containers, all placed for good posture, and lifting loads to washer.

PLATE XIII

Figure A

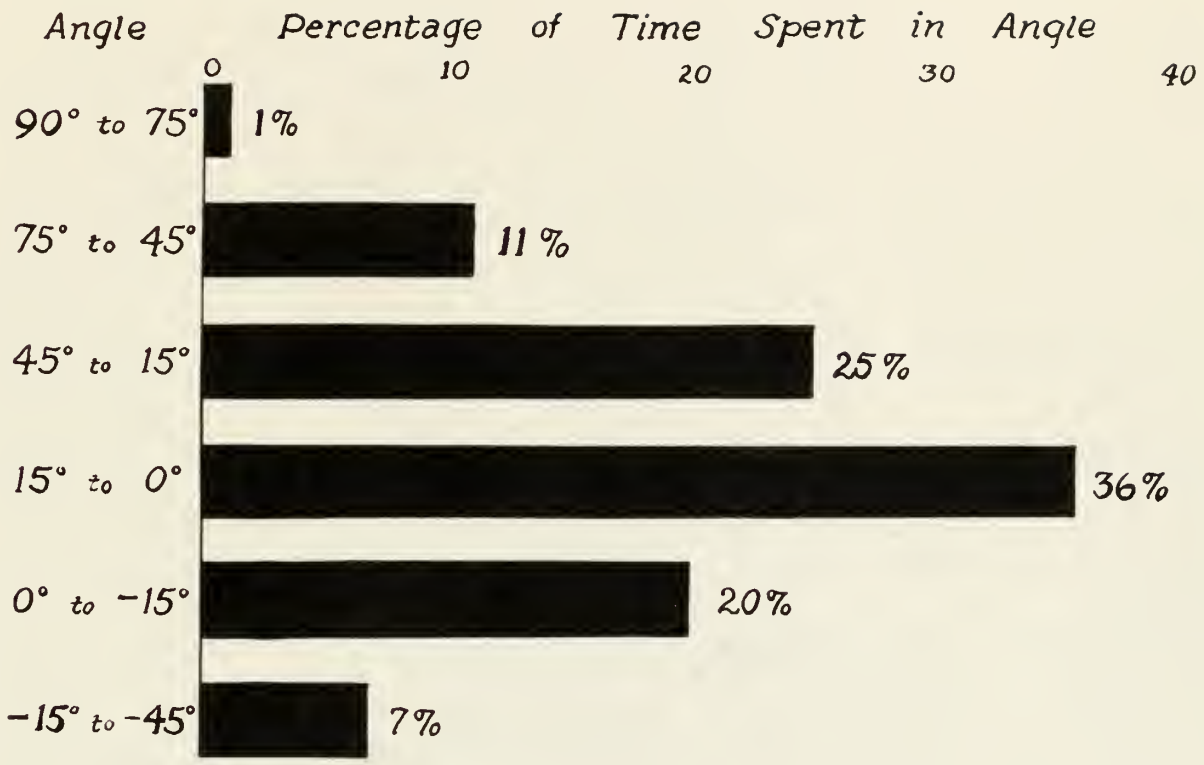
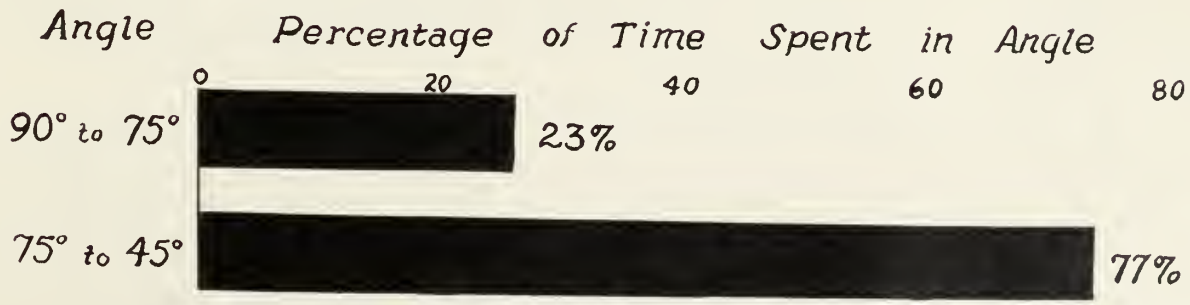


Figure B



EXPLANATION OF PLATE XIV

Operator spent 1 per cent of total sorting period within a 90° to 75° angle. She started the task in this position of good posture and did not return to it again until the task was completed.

PLATE XIV

EXPLANATION OF PLATE XV

The operator spent 11 per cent of the total period of sorting within a 75° to 45° angle. A small part of this period was spent straightening up to place soiled items to certain piles of sort.

PLATE XV

EXPLANATION OF PLATE XVI

The operator also loaded the washer in the 11 per cent of the total sorting time. She was also working within the 45° to 75° angle of bend as she placed soiled items in the washer.

PLATE XVI

EXPLANATION OF PLATE XVII

The operator spent 25 per cent of the total sorting time within a 45° to 15° angle of bend. Here she spent time determining on which sort pile to place soiled items.

PLATE XVII

angle, the operator's ear was in nearly a horizontal line with her hip. In this degree of bend where she spent 36 per cent of her time, she was working lower and lower into the basket, lifting soiled items out for the piles of sort, Plate XVIII.

Considerable curve was evident in the operator's spine and shoulders as she was reaching for last items in the basket. In this angle of 0° to -15°, she spent 20 per cent of the total time for the sorting process. It was noted that her fingers were within 3 inches of the floor when she worked in this angle. According to the Bratton study, bending down to within 3 inches above the floor required 19 times as much oxygen as reaching to the easy reach height of 46 inches. This, and her statement that women generally do not realize how much they are lifting when they pick up a small object from the floor, is important as applied to this study. Her conclusion was that the energy cost of lifting the small object is not appreciable, but that of lifting a large proportion of the body is considerable, Plate XIX.

The operator worked 7 per cent of her time in the low angle of bend, -15° to -45°, bending her knees slightly and reaching to pick up the last items in the basket, and also bending low to grasp the loads from the floor for loading the washer. In the micromotion study, it was noted that the operator did not use a knee bend as much as the trunk bend. This is a common fault. The knee bend is recommended by specialists concerned in body mechanics because it involves the large, strong muscles of the legs and thighs, while the trunk bend uses the smaller muscles of

EXPLANATION OF PLATE XVIII

The operator spent 36 per cent of the total sorting period within a 45° to 15° angle as she sorted from the upper half of the basket.

PLATE XVIII

EXPLANATION OF PLATE XIX

The operator spent 20 per cent of the total time of the sorting process within a 0° to -15° angle of bend, as she sorted from the lower part of the basket.

PLATE XIX

the back. The knee bend permits the trunk to be held comparatively straight. The trunk bend distorts back alignment and compresses internal organs, Plate XX.

When working conditions were set up to meet the postural requirements of the operator so that she could sort within her easy reach without stooping or bending, the deep angles of bend were almost entirely eliminated. This would eliminate energy losses, encourage good postural practices, and allow work to be done more efficiently.

The sorting basket was placed at a 26 inch level and the sorting boxes to the same level to meet easy postural requirements of the operator. The boxes were also placed for best sequence of motions. Then the micromotion film was used again to record her reaching, bending and twisting motions. This time, all the sorting process was done with the angle of slight bend above a 45° angle. She was in the good posture area of 75° to 90° bend for as much as 23 per cent of the total time, Plate XXI. Twisting of the trunk muscles was also eliminated as the operator faced her work all at the right height and within easy reach. Plates XXII and XXIII demonstrate improved postural practices of operator as she works within a 75° to 45° angle of bend for 77 per cent of the time of the sorting process.

To alleviate strain while standing at work areas that cause the worker to bend over slightly at the task, one foot should be advanced with the weight on the forward foot. This stance provides a broad base to give stability with little strain in maintaining body balance. When

EXPLANATION OF PLATE XX

The operator spent 7 per cent of the total time of the sorting process within a -15° to -45° angle of bend. In this degree of bend she was lifting sort piles from the floor to transport them to the washer.

PLATE XX

EXPLANATION OF PLATE XXI

When working conditions were set up to meet postural requirements, the operator spent 23 per cent of the total time of the improved method of the sorting process within a 90° to 75° angle of bend. Within this angle of bend, she was sorting from the upper half of the basket.

PLATE XXI

EXPLANATION OF PLATE XXII

The operator spent 77 per cent of the total time of the improved method of the sorting process within a 75° to 45° angle of bend. A part of this time was spent sorting from the lower part of the basket of soiled clothes.

PLATE XXII

EXPLANATION OF PLATE XXIII

The operator remained in the 75° to 45° angle of bend while transferring sort piles from sort boxes to washer.


WHITE
SOIL
WHITE
LIGHT SOIL
LIGHT COLOR
LIGHT SOIL
DARK COLOR
LIGHT SOIL

PLATE XXIII

standing for a long time in one place, the use of a rubber or cork mat makes a cushion under the feet.

Lighting

Good lighting adds to the cheer, comfort and efficiency of any work area. There is a feeling of annoyance and inconvenience when the worker has to work in her own light. Lighting affects posture, especially where the homemaker is wearing bi-focal glasses. Poor light forces the worker to stoop nearer the work she is attempting to do.

General lighting in kitchens and utility rooms, as recommended by lighting authorities, should be 10 foot-candles of light for general housework. When work is done at the sorting, washing or ironing center, the recommendation is that the local light level should be as much as 40 foot-candles.

In the 13 kitchens where both sorting and washing were done, a check was made to estimate the foot-candle power in the room, in case only artificial lighting might be used. It was found that less than 1 foot-candle of general artificial light was common in 30.8 per cent of these kitchens. Another group of 38.5 per cent had more than 1 but less than 2 foot-candles, and 30.7 per cent had more than 2 but less than 5 foot-candles of artificial illumination. The latter group was using fluorescent lighting.

From this, the conclusion would be that the general lighting in these kitchens is most inadequate for tasks done altogether by artificial illumination, Table 9.

Table 9. Estimated illumination in kitchens where both sorting and washing were done.

Type of lamp bulb	Per cent of kitchens	Size (sq. ft) of kitchens.	Watts	Lumens	Estimated Foot-candles
Incandescent	15.4	100	100	1630	1.6
Incandescent	15.4	144	100	1630	1.2
Incandescent	15.4	120	60	835	.7
Incandescent	7.7	120	75	1150	1.0
Incandescent	7.7	160	80	930	.6
Incandescent	7.7	135	120	1670	1.3
Fluorescent	7.7	120	60	3240	4.6
Fluorescent	7.7	168	60	3240	3.6
Fluorescent	7.7	144	60	3240	4.4
Fluorescent	7.7	182	40	2400	2.7

Under normal conditions, the women in this study did the laundry during the day, and did not have to resort to artificial illumination unless the day was dark and stormy. Therefore, the efficient use of natural light was an important factor, and 86 per cent of the women did have their sorting area near a window. To use natural light efficiently, it would be important that windows be kept spotlessly clean and that curtains and screens would not lower the lighting level for the room.

Age Groups and Their Attitudes toward the Task

The sorting process is of short duration, and is finished within a few minutes. It is probably the short time element that made 76 per cent of all the cooperators say they considered it an easy task. They did admit, however, that they often were confused in making a decision in placing an item in its proper sort load. Only 22 per cent of the group thought the sorting process was tiresome. There were 2 per cent who did not know — it was a job that had to be done so they just did it.

When the cooperators were asked if they thought an easier method of sorting clothes could be arranged in their present set-up, 64 per cent thought it could be improved, but how to do it was the problem. Another 20 per cent said that they were sure there was not any way to improve it. Then, there were 16 per cent who did not know, and could not see a better way.

There was some variation in the way the families of the various age groups responded to these questions. The homemakers in the expanding or

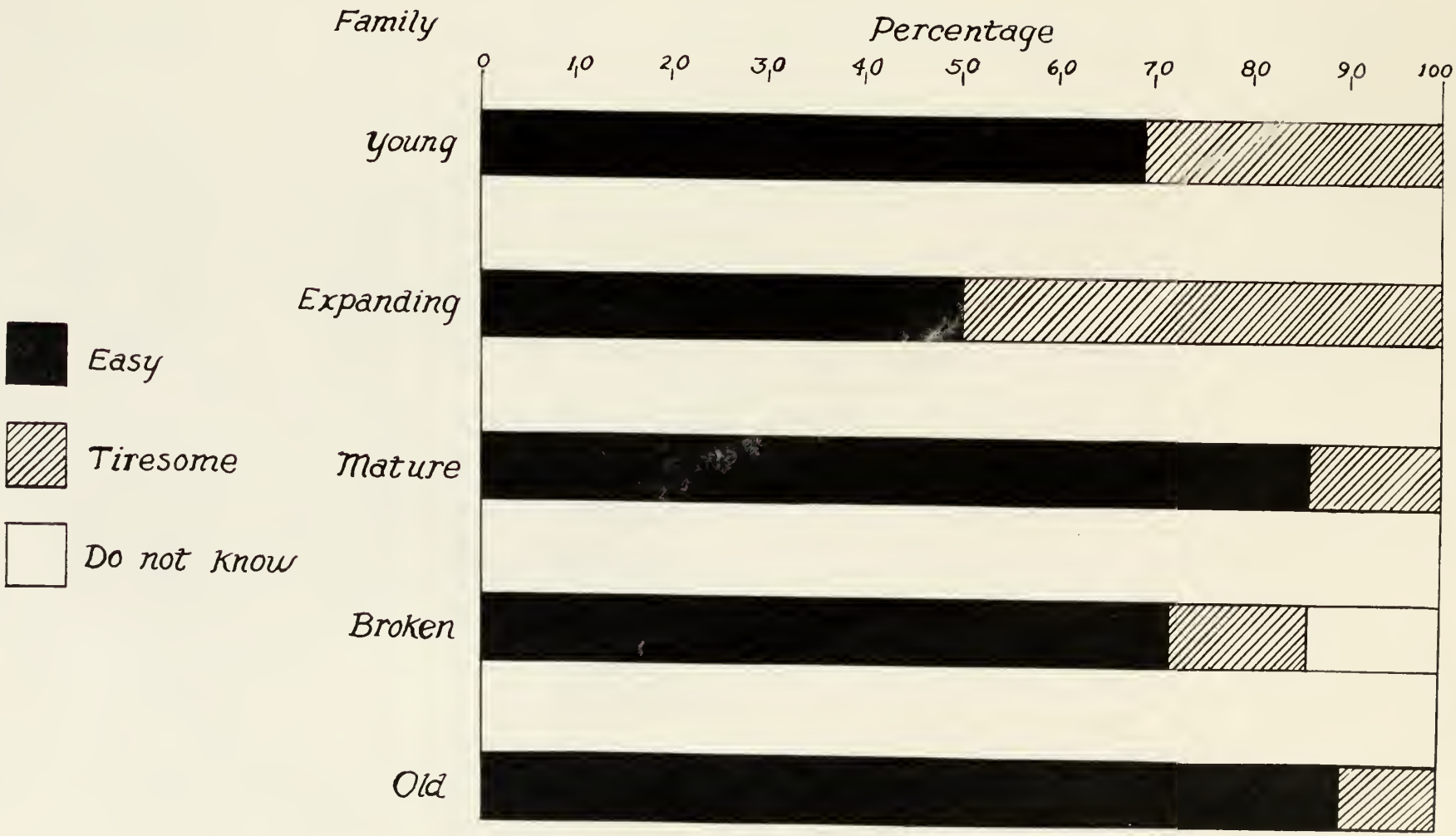
growing families were about equal in their opinion as to whether the task was easy. A predominance of all the other types of families were of the opinion that it was easy. As to the question whether there was an easier way, all the expanding families thought that there was. The young and the mature groups were about equal in their opinions on this question in that two-thirds of them thought there might be an easier way. Only about half of the broken and old families showed any interest in talking about an easier way.

When the sorting practices of homemakers in the various age groups were compared with their opinions as to improvement of the sorting process in their homes, certain similarities were apparent. In the expanding group, all of whom had thought there should be improvement, only half were now using the floor in some form for sorting. The other half had found an area above the floor to sort. Half of the mature families were using the floor for sorting, and only two-thirds felt that improvements could be made. Although the attitudes of the young family toward improvement of the sorting process was similar to that of the mature family, their practices were worse as four-fifths of them used the floor in some manner for the process. A little over half of the broken families were interested in improvement of the sorting process, and a little over half used the floor in some manner. The old families were the least amenable to improvement, and about four-fifths of them were using the floor, Plates XXIV, XXV and XXVI.

EXPLANATION OF PLATE XXIV

Comparison by age groups of their attitude toward the ease or tiresomeness of the sorting task.

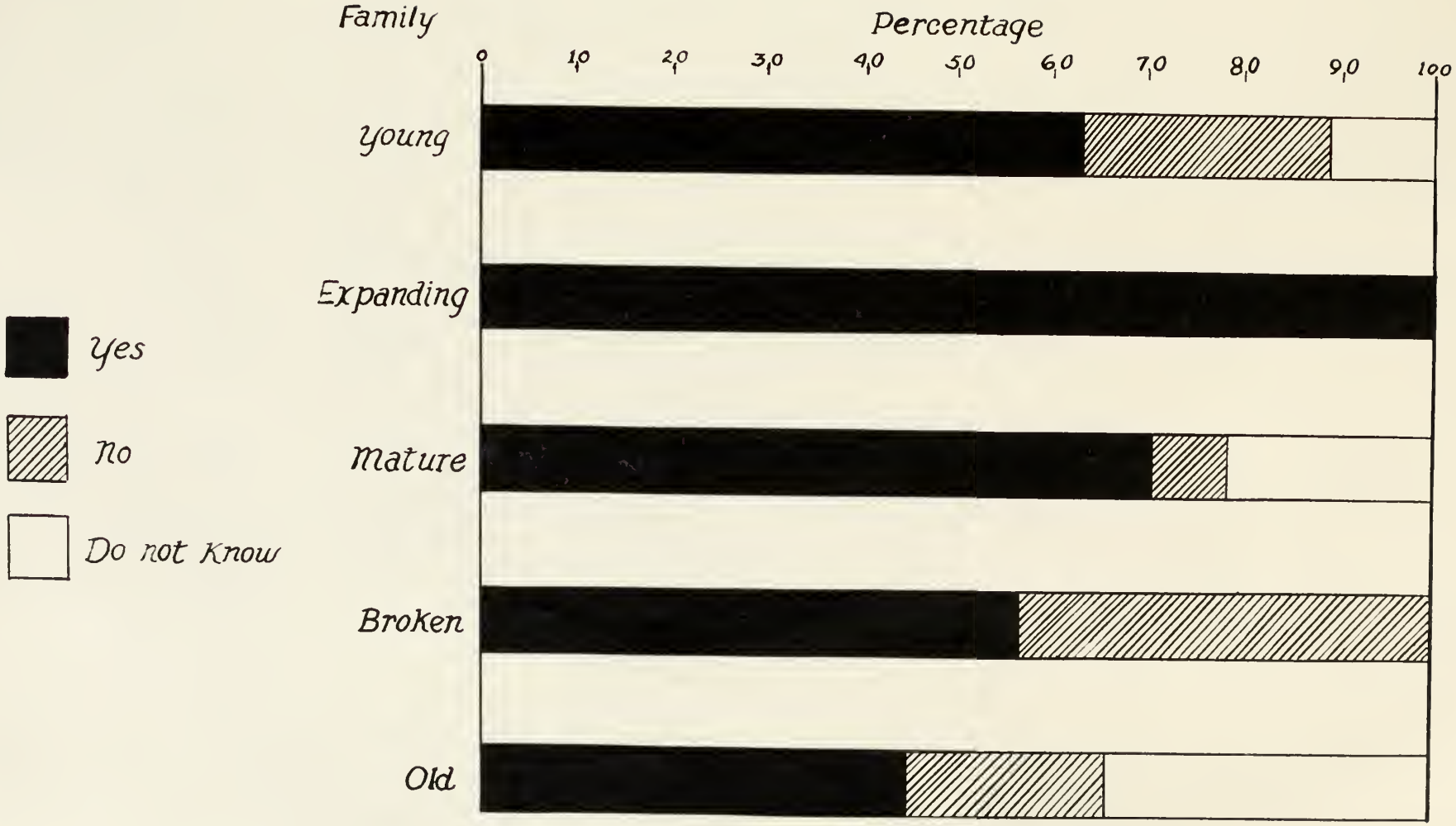
PLATE XXIV


Family
Percentage
0
10
20
30
40
50
60
70
80
90
100
Young
Expanding
Mature
Broken
Old
Easy
Tiresome
Do not know

EXPLANATION OF PLATE XXV

Comparison by age groups and their attitude as to whether the sorting task could be improved in their homes.

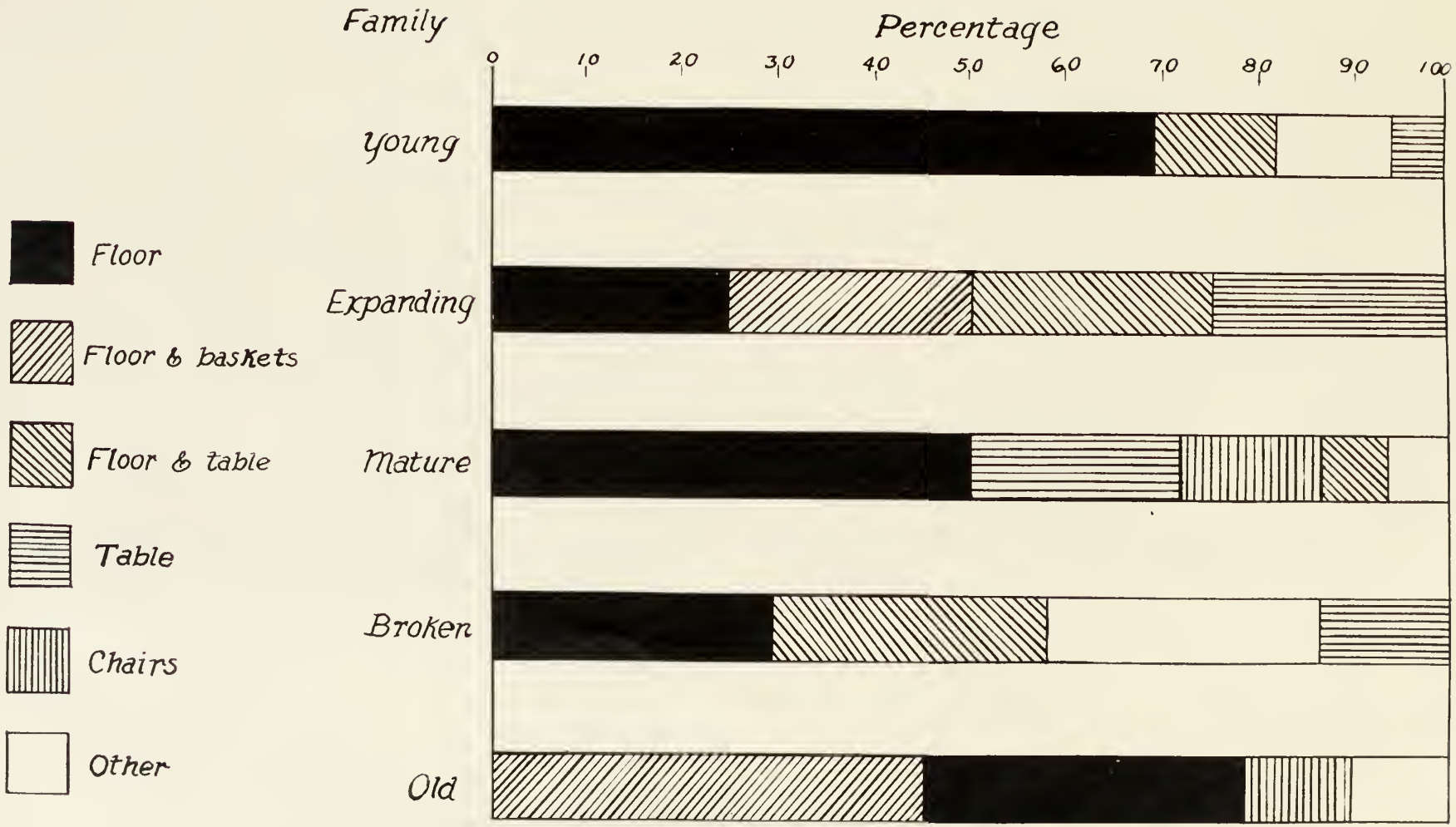
PLATE XXV


Family
Percentage
0
1,0
2,0
3,0
4,0
5,0
6,0
7,0
8,0
9,0
100
Young
Expanding
Mature
Broken
Old
Yes
No
Do not Know

EXPLANATION OF PLATE XXVI

Comparison by age groups as to the surface area used for sorting.

PLATE XXVI


Family
Percentage
0
10
20
30
40
50
60
70
80
90
100
Young
Expanding
Mature
Broken
Old
Floor
Floor & baskets
Floor & table
Table
Chairs
Other

SUMMARY

Because houses in this study did not have built-in storage area for soiled clothing and linens, baskets and hampers were used by 70 per cent of the homemakers. These containers were located in closets, porches and bedrooms by 76 per cent of the group.

In winter, the kitchen was used for both sorting and washing by 76 per cent of the homemakers, but sorting was done in an adjacent room in the other homes.

Soiled clothes were carried to the sorting center by 90 per cent of the homemakers. Three-fourths of them used the floor to sort the wash into 6 or 7 sort piles.

Unconfined floor space for sorting 6 sort loads required 24 square feet; a somewhat smaller space on a sorting table with sort piles slightly confined required 18 square feet; confined area in a holding device or box required 16" x 16" x 12".

Poor postural practices were followed in sorting to floor level. Homemakers were bending low over the task for 88 per cent of the sorting period. Improved arrangements and working heights corrected postural practices.

Low levels of light often make household tasks difficult to do on cloudy, dull winter mornings. It was estimated that artificial lighting in the 13 kitchens where both sorting and washing was done produced only 1 to 5 foot-candles, instead of the 10 foot-candles of recommended general illumination.

The homemakers with expanding or growing families were most ready to admit that improvements might be made in sorting practices in their homes. Experienced homemakers had stronger opinions about ways of doing the task in their home, and were slower to admit change could be made.

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APPENDIX

INTERVIEW -- SCHEDULE

1. What thpe of washing machine do you have?

Type	Check
Wringer-type machine:	
Power	
Hand-operated	
Semi-automatic	

Type	Check
Automatic	
Portable	
Wash tub & scrub board	
Other	

2. How many pounds of dry soiled clothes is your machine bult to handle?

Pounds	Check
4 or Less	
4 to 6	
6 to 8	

Pounds	Check
8 to 10	
10 to 12	
Other	
Don't know	

3. How do you decide you have the right weight load?

	Check
Size of articles	
Feel of articles in water	

	Check
Number of articles	
Weight of the load	
Other	

4. Before you place soiled items in the usual storage area for soiled things, do you have a temporary storage? Yes_____ No _____

If yes - Where? _____

5. Where is your usual storage area for soiled laundry for the week?

Place	Ck.	No. of Rms.	Household & Personal Laundry		Use a Container?		Type of Container Used				
			Together	Separate	Yes	No.	Hamper	F.Basket	Bag	Box	Other
Bathroom											
Bedroom											
Closet											
Hall											
Laundry: Main floor											
Basement											
Wash house											
Stairway											
Kitchen											
Porch											
Other											

6. How are these soiled items carried to the place where you sort them into loads?

_____

_____

_____

7. In what room do you sort?

	Check
Utility:	
First floor	
Basement	
Wash house	

	Check
Kitchen	
Porch	
Other	

8. When you enter this room with soiled items to be sorted, where do you place them

	Check
Table	
Chair	

	Check
Floor	
Container already located with no sorting necessary	

9. Do you sort from the container you carried? _____

Do you empty the container and then sort? _____

10. As you sort, where are the loads placed?

	Check
Machine	
Floor	
Table	
Chair	
Tubs	

	Check
Baskets	
Boxes	
Bags	
In a pre-soak container	
Other	

11. Do you do anything about stain removal or mending before the clothes are washed? Yes _____ No _____

If Yes - When? Before eash day? _____ As I sort? _____

What do you do? _____ How? _____

System	Stain Removal	Mending
Nothing		
Kit set up		
Supplies: Accessible		
Scattered		
Others. (State)		

12. Do you stand _____ or sit _____ as you sort?

13. What pieces were in your laundry the last time you washed?

In what load or loads were they placed?

Item	No. of Items	Loads 1	2	3	4	5	6	7	8	9	10	Other	Special
Bedding:													
Sheets													
Sheet blankets													
Pillow cases													
Spreads													
Blankets													
Other													
Bathroom:													
Bath towels													
Hand towels													
Wash cloths													
Bath mats													
Other													
Linens:													
Place mats & doilies													
Table cloths													
Dresser & table scarves													
Napkins													
Dish towels													
Hand towels													
Other													

Items	No. of Items	Loads 1	2	3	4	5	6	7	8	9	10	Other	Special
Women's & Girls'													
Cotton dresses													
Other dresses													
Slips													
Panties													
Girdles													
Brassiers													
Aprons & smocks													
Underwear													
Gowns or pajamas													
Anklets or hose													
Sweaters													
Jackets													
Blouses													
Skirts													
Jeans													
Other													
Men's & Boys'													
Shirts													
Shorts													
Union suits													
Heavy underwear													
Night shirts													
Pajamas													

Items	No. of Items	Loads 1	2	3	4	5	6	7	8	9	10	Other	Special
Men's & Boys' (Cont.)													
Wash pants													
Overalls													
Socks													
Jackets													
Sweaters													
Other													
Babies'													
Dresses													
Gowns													
Slips													
Diapers													
Blankets													
Undershirts													
Other													
Other:													

14. Do you carry the sorted load to the machine in one _____, two _____, or more _____ trips?

15. Do you carry it in arm loads? _____

Or in the container in which it was sorted? _____

16. Do you consider the process of sorting an easy task? _____

Or do you consider it a tiring task? _____

17. Do you think there would be an easier way to sort the wash in your present set-up? Yes _____ No _____ Don't know _____

18. The family:

Family Member												
Age												
Any chronic illness affecting laundry practices												

19. The present laundry area:

Size: _____

Is the sorting area near a window? Yes _____ No _____

Is there an electric light over the sorting area? Yes_____ No _____

If yes - is it incandescent? _____ fluorescent? _____ size of bulb. _____

ARRANGEMENT FOR THE SORTING PROCESS OF HOME LAUNDERING AS AFFECTED BY ECONOMY OF MOTION

by

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B. S., Kansas State College
of Agriculture and Applied Science, 1926

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INTRODUCTION AND PROCEDURE

Many requests come from Kansas families for suggested laundry sorting centers for homes with limited space, where optimum requirements cannot be met. Toward the solution of problems connected with sorting, the purposes of this study were: (1) to determine the sorting practices for the laundry of selected farm families; (2) to develop motion and time saving sequences for improving the sorting process of the laundry; (3) to determine sorting space requirements; (4) to design simple and inexpensive arrangements of space and holding devices which save time and motion, and permit recommended postural practices.

Information was obtained by interviewing fifty homemakers in a designated area within driving distance from Manhattan, Kansas. By use of an interview schedule, the existing practices of sorting and information concerning the families and their homes that would affect sorting practices were found. Data were tabulated and used along with a micromotion study to develop a minimum adequate sorting center.

PRINCIPAL FINDINGS

Houses in this study had been planned so that 98 per cent of them had no special place for the collection of soiled clothing and linens. Baskets, hampers, boxes and bags were used by 88 per cent of the group, and were located in closets, porches, bedrooms and bathrooms near the place where soiled items collected.

The sorting center and the washing area were in the same room, usually the kitchen in winter, in 76 per cent of the homes. However, due to limited space there, in 24 per cent of the homes, sorting was done in an adjacent room. All but 10 per cent of the homemakers carried the weekly collection of soiled items by armloads, or in the containers to the sorting center. Poor house designs and outmoded habits caused 72 per cent of the women to use the floor as a sorting center. They bent over the soiled items, checking and dropping each into one of the six or seven sort piles. These weighed eight pounds each, and were placed directly on, or in containers on the floor.

Space requirements for sorting each load of soiled items were 4 square feet, or for the total wash, 24 square feet of floor space. More closely packed on a sorting table, the clothes in sorted piles required 18 square feet, as previously determined by Pond and Wilson. Where small areas are used for doing the laundry, even smaller sorting space must be designed. A box, bin or drawer space, 16" x 16" x 12" was adequate for one eight pound load.

Although 76 per cent thought of the sorting process as non-tiresome, 74 per cent sorted some or all loads to the floor. Micromotion study revealed that in sorting to the floor and in loading the washer from the floor, the average worker spent 11 per cent of her time bent to an angle of 45° to 75°; 61 per cent to an angle of 0° to 45°; 20 per cent to an angle of 0° to -15°; and 7 per cent to an angle of -15° to -45°. The worker remained within the 75° to 90° angle, wherein good posture is maintained, only 1 per cent of the total time. As the worker faced the sorting

task, prepositioned holding devices on an elevated surface within easy reach of her hands corrected posture, and saved time and energy. Boxes standardized for the average load were developed for this. Twenty-three per cent of this task was then done within an angle of 75° to 90°, and the balance, or 77 per cent, within the slightly lower angle of 45° to 75°.

Lack of adequate artificial illumination makes sorting in early winter mornings difficult. Artificial illumination was inadequate to meet the standard 10 foot-candle level for general lighting in all kitchens studied. The level was between 1 and 2 foot-candles for incandescent, and 3 and 4 foot-candles for fluorescent illumination.

Attitudes of young, expanding or growing, mature, broken and old age groups, were analyzed in relation to the task of sorting the wash. Young homemakers, most of whom sorted to the floor, were inclined to say that the task was easy and that no improvement could be made. The expanding group, including some pregnant and young mothers, were the most inclined to consider the task fatiguing and to desire improvements. Although the mature, broken and older groups were more set in their decision that the task could not be improved and was not tiresome, yet more had found ways to sort above floor level.

CONCLUSION

To the writer, as an Extension worker, this study revealed:

1. That attitudes often block progress in improving work conditions.

2. That women do not value their bodies as efficient tools for accomplishing their work.

3. That better use of body mechanics principles would induce them to be interested in using their bodies in a better way.

4. That correctly designed holding devices located at personalized working heights for these women would improve work conditions.

Date Due		
Apr 16 '53 O		
Jul 6 53 A		
Jul 24 '53 W		
Dec 2 '53 O		
Oct 11 '54		
Apr 12 '56 T		
May 19 '56 T		
Jul 19 '57		
Nov 18 '58 H		
Jul 30 '59 A		
Dec 16 '59 D		
Ill. - Anth		
JUN 5 RECD		
NOV 26 1962		